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# WHAT THE COUNTRY IS DOING FOR THE FARMER.

BY W. S. HARWOOD.

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VAST as has been the progress of the United States in manufactures, in commerce, in invention, and the like, there is perhaps no branch of our national life which has shown more immense advancement in the past thirty years than that of agriculture. As the century closes, agriculture is rising from the obscurity of the years. It long since passed the stage of empiricism and is entering more broadly than ever upon a sensibly scientific career.

There was a time—it is within the memory of many now living—when the only essentials in agriculture were that the farmer should buy his seed, plant, till, and reap. Indeed, there are wide regions yet where tillers of the soil still labor under the delusion that a man who has failed in all other lines may be successful in agriculture, that it requires no education, no preparation, no knowledge of science to be a successful farmer. The fact that so great a portion of our national domain in the Central West has been blessed with a soil of prodigal productiveness has led men, all unconscious of the real conditions of affairs, to place no confidence in anything but the soil's fertility, to accept failures of crops as unavoidable visitations of Providence, to ignore the aid which science stands ready to give all who will accept it.

But the patient, ignorant man who planted wheat year in and year out on soil that had become exhausted, who tried to raise corn on soil which was never intended for it, who never gave a thought to the rotation of crops other than to laugh at the suggestion, who went steadily forward through a succession of failures with a tenacity which would have been heroic were it not so pitifully stupid, this farmer, sad figure that he was, is passing; and in his place there comes the man who has learned that to be

a successful farmer in the broad sense he must have education, he must rely upon science, he must fit himself liberally for his occupation. The instances where men have been densely ignorant of the rudimental elements of farming and yet have succeeded are so few that their existence serves to be valuable only as a proof of the generosity of the soil they have cultivated.

It has been the writer's fortune to be more or less intimately in touch with the work of one of the leading agricultural colleges and experiment stations of the United States for the last four or five years. In studying the scope of this dual institution, which is but a type of a large number now to be found in the United States, it has been manifest at every step that two dominant principles ruled. They may be stated in this wise :

1. The education to be given a young man from a farm should be such that he will be able to go back to the farm fitted to take up the actual work of the farm from the standpoint of an enlightened, educated, scientific workman.

2. That nothing should be taught with a view of leading him to forsake the farm at graduation, but that every possible influence should be brought to bear to cause his return to the farm as a preferred place for his life work.

In considering somewhat the importance of the agricultural advancement of the century, the influence of the agricultural colleges and experiment stations must be taken into consideration as an all-important factor. To the State of Michigan is due the credit of establishing the first agricultural college in the United States for the education of young men in the essentials of scientific agriculture. And yet this institution, the first of its kind in a country of vast agricultural possibilities, was not established until the year 1857. The progress thereafter in other States was slow and hesitating. The upheaval of the War of the Rebellion did much, North as well as South, to disturb the movement set on foot in Michigan. While the need of education for farmers was becoming more and more imperative, it required something more definite than anything which had preceded to crystallize public sentiment. In the midst of the Civil War the passage of the Morrill bill establishing what were termed land-grant colleges for the purposes of agricultural education, was not an act attracting great public attention; but when the war was over the wisdom of the provisions of this measure—now well known to the public

—became apparent and the agricultural colleges began springing up all over the land.

There are now agricultural colleges, or those other universities or colleges having agricultural courses which come under the provisions of the Morrill bill and reap its benefits, in every State and Territory in the Union, and in every section but Alaska.

Perhaps even more important in some ways in the wide growth of agricultural education in the last twenty years than these agricultural colleges are the experiment stations established, as a rule, in connection with the colleges and supported by government funds. Director A. C. True, of the Office of Experiment Stations of the United States Department of Agriculture, defines an experiment station as an institution in which scientific and practical investigations are made with a view to improving the methods of agriculture or introducing new crops or industries, the primary object being to apply scientific principles and methods to the problems of agriculture.

The first agricultural experiment station in the world was established within the last half-century, a product of German thought. This station was established near to the city of Leipsic, at a little town named Moeckern, by a number of intelligent farmers who were anxious to make use of the aid of science in conducting their farms. This was in 1851, and since that time about three hundred similar stations have been established in the world, broader in their scope and wider in their possibilities than the humble gathering of German farmers, but no more true to the demands of a higher agricultural education. Connecticut established the first experiment station in the United States in 1875, and there are now forty-six stations in the United States, several of which have sub-stations for the carrying on of field experimental work. Each station receives the sum of \$15,000 per annum from the general government for its maintenance, and there are various bequests from private individuals and from individual States increasing this amount handsomely in some instances. It requires about eight hundred thousand dollars per year to pay the expenses of the stations.

The act of Congress establishing this important system of agricultural experimentation outlines the object and duty of the stations as follows:

“To conduct original researches or verify experiments on the  
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physiology of plants and animals—the diseases to which they are severally subject, with the remedies for the same ; the chemical composition of useful plants at their different stages of growth ; the comparative advantages of rotative cropping as pursued under a varying series of crops ; the capacity of new trees or plants for acclimation ; the analysis of soils and waters ; the chemical composition of manures, natural or artificial, with experiments designed to test their comparative effects on crops of different kinds ; the adaptation and value of forage plants and grasses ; the composition and digestibility of the different kinds of foods for domestic animals ; the scientific and economic questions involved in the production of butter and cheese ; and such other researches or experiments bearing directly on the agricultural industry of the United States as may in each case be deemed advisable, having due regard to the varying conditions and needs of the respective States and Territories.”

This, of course, is a more or less perfunctory outline of the duties of these institutions. It is hardly possible to mention a department of modern agriculture into which the experimental work has not been carried to a large, a practical, and a commercially satisfactory conclusion.

In the colleges which aid in the present-day diffusion of the knowledge of scientific agriculture there are extended courses of study, embracing investigation into almost every science in the curriculum, while the original investigation carried on by the professors and the advanced students in the coördinate work of the experiment stations in connection with the colleges, affords an admirable opportunity for putting into practical form the theoretical knowledge of the books as well as giving an impetus to still more extended original investigation.

One is bewildered when one comes to a consideration of the practical results of the investigation of these experiment stations and of the teaching and investigation of the agricultural colleges. In every portion of the country, whatever be the product of the particular location, the scientific educator and experimenter of the last twenty years has been able to protect the farmer from ravages by injurious insects, to teach him how to conserve the products of his soil, to help him to enhance the value of the products of his labor. Let me give an instance or two coming under my own observation.

In the great wheat regions of the Central West, particularly in that portion of the Mississippi Valley embraced in the States of Minnesota and North and South Dakota, millions of dollars worth of wheat have been destroyed in the past years by the devastation of the chinch bug. Various kinds of preventives were used with greater or less success, but they were not eradicators; they were makeshifts. Scientific investigators in various experiment stations began experiments looking to the cultivation of a particular bacillus or spore that constituted a disease from which the chinch bug was sure to die. Healthy bugs were collected, dusted with the disease which had been cultivated on some of the various mediums suitable for its growth, and the artificially contaminated bugs were scattered among the healthy ones. The result, even on a moderate scale of treatment showed a rapid distribution of the disease among the healthy bugs. Further experiments carried on in the summer of 1895, and under way in the summer of 1896, indicate clearly that the end of this scourge is at hand. It has been demonstrated that, if the farmers, to whom the disease is sent in closed glass jars, will do their part in intelligently following the instructions of the station experts, the danger from a pest which has worked enormous havoc is practically at an end.

In the institution of which I have spoken the instructor in the veterinary department some two years ago began investigation into the use of tuberculin as a test for consumption, or tuberculosis, in cattle. He selected some of the choicest cattle on the station farm—cattle of various important strains of blood. The use of tuberculin as a test or as a curative in human beings had been checked by apparent failures; but this investigator, believing there was virtue in the tuberculin, began his series of experiments with vigor and scientific sense. He found a large percentage of the high-bred home herd of cattle responsive to the test. Some of the animals were killed and the inerrancy of the tuberculin shown in all cases. Others, shown to be diseased by the unfailing symptom of rising temperature after treatment, were isolated and treated for several months in a manner original with the instructor, the results showing remarkable curative powers. Some of the animals which had been shown to be highly consumptive were killed after some months of treatment and the diseased tissues were found to be largely healed. Investigations in the same

and other schools now under way indicate that ere long there will be a complete cure assured in a large percentage of the cattle found diseased. The veterinarian in point has treated herds of dairy cattle in all portions of his State, and the tuberculin under his hand has proven effective in discovering tuberculous cattle in at least 98 per cent. of the cases. The result has been that all those things which have been inimical to the health of the cattle—as poor ventilation, filthy stabling, innutritious food, all tending to promote tuberculosis—are now being remedied ; for the dairymen find that they cannot sell their products when made from cattle reeking with disease, no matter how sleek their sides, and the whole system of dairying of the State is being overhauled and improved as a result of the investigations of one of the instructors in one department of the agricultural college and experiment station.

Take another instance.

A well-known professor in one of the Western institutions of this type has been for ten years conducting a series of investigations in the breeding of wheats. He has demonstrated by a careful selection and consummate skill in breeding one type of wheat to another, that immensely increased yields of grain result. He has conducted the experiments on a small scale, naturally, as it requires a long time to get results when the experimenter starts with only two kernels of wheat to produce a race of wheat, but the investigations have shown that it is wholly feasible to produce a type of wheat, absolutely original in nature, which will increase the yield of wheat in this country, and perhaps in the rest of the world in similar latitudes, by an enormous percentage. During the season of 1896 the experiments are being carried out on a more extensive scale than ever, and the result of the field work at one of the sub-stations is quite likely to add some new and powerful varieties of wheat which will replace the already high type of the famous wheat regions of the Northwest.

So one might enumerate instance after instance, not confined to any one section of the country, to show the singularly practical nature of the work done in these agricultural colleges and experiment stations.

At regular intervals the colleges and stations issue bulletins, usually stripped of all scientific verbiage, which are distributed free of charge through the mails to the farmers of the State.

These bulletins contain the condensed results of the experiments in the breeding of cattle, in the improvement of small fruits, in the methods for the destruction of dangerous insects, in food analysis to determine both for man and beast what foods are most helpful, in soil analysis to find out what grains particular kinds of soils will best produce, and in a wide variety of other lines.

Through the kindness of Director True, of the office of Experiment Stations at Washington, I give this condensed statement of the scope of the work now in progress at these stations, all of which work is done in the institutions which conduct agricultural courses for the education of farmers.

Thirty stations are studying problems relating to meteorology and climatic conditions. Forty-three stations are at work upon the soil, investigating its geology, physics, or chemistry, or conducting soil tests with fertilizers or in other ways. Twenty stations are studying questions relating to drainage or irrigation. Thirty-nine stations are making analyses of commercial and home-made fertilizers or are conducting field experiments with fertilizers. Forty-eight stations are studying the more important crops, either with regard to their composition, nutritive value, methods of manuring, and cultivation, and the best varieties adapted to individual localities, or with reference to systems of rotation. Thirty-five stations are investigating the composition of feeding stuffs and, in some instances, making digestion experiments. Twenty-five stations are dealing with questions relating to silos and silage. Thirty-seven stations are conducting feeding experiments for beef, milk, mutton, or pork, or are studying different methods of feeding. Thirty-two stations are investigating subjects relating to dairying, including the chemistry and bacteria of milk, creaming, butter-making, or the construction and management of creameries. Botanical studies occupy more or less of the attention of twenty-seven stations, including investigations in systematic and physiological botany, with a special reference to the diseases of plants, testing of seeds with reference to their vitality and purity, classification of weeds and methods for their eradication. Forty-three stations work to a greater or less extent in horticulture, testing varieties of vegetables and large and small fruits. Several stations have begun operations in forestry. Thirty-one stations investigate injurious insects with a view to their restriction or their destruction. Sixteen study



and treat animal diseases or perform such operations as the de-horning of animals. At least seven stations are engaged in bee culture, and three in experiments with poultry.

The influence of the graduates of these agricultural institutions upon the farmers in the vicinity to which they go after being graduated is very great. Some of the earlier institutions made the mistake of introducing too extensive a course of such studies as were needed for ornament rather than for use, and to this, no doubt, is to be attributed the failure of a good many students of agricultural colleges to return to the farms for their life work. The more advanced institutions of to-day, however, are aiming to make the instruction appropriate for practical uses on the farm rather than to attempt that pleasant and, indeed, commendable, but in this case inappropriate, breadth of culture which is afforded in more classical courses.

In order to ascertain with as much definiteness as possible the percentage of students in agricultural courses who go back to the farms, the writer requested the following information from the presidents of the various agricultural colleges and from the presidents of such colleges and universities as have agricultural courses :

1. The number of students in agriculture.
2. The number graduated since the establishment of the college.
3. The percentage of students in agriculture going back to the farms after graduation.

Some of the institutions are universities having agricultural courses, some have distinct agricultural colleges in the body of the university, some are agricultural colleges alone, and some are industrial and agricultural combined, so that it is difficult to arrive at absolute definiteness. The following table, however, prepared during the month of July, 1896, will give a comprehensive view of the work. It will be noted that the number of students in agriculture going back to the farms varies much. In some States there is little agricultural activity, and there is a tendency in some quarters to a too generous curriculum, leading the young men to enter the professions rather than to become agriculturalists : the model institution will so shape its courses that the student will perforce become an agriculturalist.

No account is made in this table of the large number of

students who do not graduate, but who, after one or two years of work, return to the farms. Neither is there any showing of the very large number of actual farmers who attend the schools for dairymen, running for a month or two each season in many of the agricultural colleges established to give farmers a more scientific knowledge of this particular line of farm work, nor of the many young women, not regular students, who come in from the farms to study a few weeks or perhaps two months in the branches particularly helpful to them—dairying, dressmaking, physiology, care and cooking of foods, farm chemistry, and all the various lines which may be included in the department of domestic economy. A very important work is done in these two last-named departments which does not have any statistical value. There are no graduates in these schools for non-students, and courses of study are not so much followed as are plain, practical talks and lectures from professors and instructors. And yet the influence of even this fragmentary work is of great value.

The table referred to is as follows ; where the name of the State alone is given the institution is a part of the university of the State :

Name of institution.	No. of students in agriculture.	Number graduated.	Percentage returning to farms.
Iowa Agricultural College.....	96	252	50
Alabama Agricultural College.....	103	187	10
Colorado " ".....	232	80	80
North Carolina " ".....	20	56	25
North Dakota " ".....	11	2	100
Maryland " ".....	20	—	90
Pennsylvania " ".....	340	305	—
Massachusetts " ".....	176	476	62
Texas " ".....	181	53	14
Mississippi " ".....	122	133	75
Oklahoma " ".....	167	6	60
New Hampshire Agri. College.....	153	157	20
Michigan " ".....	234	622	34
Utah " ".....	—	5	50
Rhode Island " ".....	121	19	90
Vermont " ".....	79	10	40
Indiana Sch. of Agri., Purdue University.....	64	175	75
Wisconsin.....	98	12	50
Cornell University, New York.....	141	86	100
Alcorn Agri. College, Mississippi...	200	80	50
Nebraska.....	45	—	75
Ohio.....	84	28	—
West Virginia.....	6	—	100
Storrs Agri. College, Connecticut..	138	120	75
South Dakota Agricultural College	24	46	—
Minnesota " ".....	233	138	92

The total number of students in agriculture in the various institutions of the United States in the autumn of 1896 will be

in the neighborhood of five thousand. Nearly four thousand have been graduated since these institutions were established. Nearly eleven millions of acres of land have been granted to these institutions by the general government, and over nine million five hundred thousand dollars have been realized from the sale of the land so far put on the market. The value of the buildings and grounds of the various institutions is about sixteen millions of dollars ; of libraries, a little over one million of dollars ; of scientific apparatus, two million five hundred thousand dollars ; while the annual revenue amounts to over four millions of dollars.

The agricultural progress of the closing century has been made under great difficulties, at the cost of untold treasure, at the sacrifice of enormous natural resources, amidst the almost criminal squandering of precious substances. The nation has not been "strangled with her waste fertility," for there has been vast return from the labor expended, so generous the soil ; and yet, judged by the progress made since scientific agriculture began to distribute its forces, the coming century will witness a development of new, and a restoration of old, soils resulting in returns undreamed of by the most sanguine followers of the noble calling of agriculture.

W. S. HARWOOD.